CLAIMS

What is claimed is:

1. A method of detection and identification of analytes in a sample based on at least an aspect of ion mobility, comprising:
(a) obtaining a volatilized sample comprising markers that are detectable by ion mobility; and
(b) directing at least a portion of the volatilized sample to a differential ion mobility detection spectrometry (DMS) device, to obtain a mobility-based signature of at least one marker, wherein the mobility-based signature correlates with the analytes,
thereby detecting and identifying at least one analyte in the sample.

2. The method of Claim 1 wherein the sample is from a physiological, environmental, biological, chemical, agricultural or industrial source.

3. The method of Claim 2 wherein the sample is a volatile sample.

4. The method of Claim 3 wherein the sample is obtained by filtration, distillation, sublimation or collecting the headspace at the source.

5. The sample of Claim 2 wherein the sample is a volatilizable sample.

6. The method of Claim 5 wherein the sample is volatilized by pyrolysis, thermal desorption, solid phase microextraction/temperature-programmed desorption, laser ionization, matrix assisted laser desorption ionization (MALDI), microwave excitation or chemical transformation.

7. The method of Claim 5 wherein the sample is volatilized by pyrolysis.

8. The method of Claim 2 wherein the volatilized sample is further separated by gas chromatography, desorption/absorption, effusion, condensation, filtration or ion exchange.

9. The method of Claim 2 wherein the sample includes an analyte selected from the group consisting of fungi, bacteria, virus, proteins, polypeptides, nucleic acids, polysaccharides, lipoproteins, glycoproteins, fatty acids and small molecules.

10. The method of Claim 9 wherein the analyte is selected from the group consisting of *B. anthracis* spores and *B. subtilis* spores.

11. The method of Claim 2 wherein samples sources are selected from physiological fluids, breath or food.

12. The method of Claim 11 wherein the sample is from headspace of urine or headspace of a food sample.

13. The method of Claim 2 wherein the sample source comprises organic compounds.

14. The method of Claim 13 wherein the organic compounds are stereoisomers.

15. The method of Claim 2 wherein the sample source is a chemical warfare agent.

16. The method of Claim 1 wherein the volatilized sample is optionally directed into an ion mobility spectrometry (IMS) device to obtain a mobility-based signature of at least one marker, wherein the mobility-based signature correlates with the analytes.

17. The method of Claim 16 wherein the mobility-based signature from IMS device is compared to the mobility-based signature from DMS.

18. The method of Claim 1 wherein the filter electrodes of the DMS device are not coaxially cylindrical.

19. The method of Claim 1 wherein the filter electrodes of the DMS device are not planar.

20. A method of detection and identification of analytes in a sample, comprising:

(a) volatilizing at least a portion of the sample to produce a volatilized sample that includes markers detectable by an aspect of ion mobility; and

(b) directing at least a portion of the volatilized sample to a differential ion mobility detection spectrometry (DMS) device, to obtain a mobility-based signature of at least one marker, wherein the mobility-based signature correlates with the analytes,

thereby detecting and identifying at least one analyte in the sample.

21. The sample of Claim 20 wherein a sample is from a physiological, environmental, biological, chemical, agricultural or industrial source.

22. The method of Claim 20 wherein the sample is volatilized by pyrolysis, thermal desorption, solid phase microextraction/temperature-programmed desorption, laser ionization, matrix assisted laser desorption ionization (MALDI), microwave excitation, and chemical transformation.

23. The method of Claim 22 wherein the sample is volatilized by pyrolysis.

24. The method of Claim 20 wherein the volatilized sample is further separated by

gas chromatography, desorption/absorption, effusion, condensation, filtration or ion exchange.

25. The method of Claim 24 wherein the volatilized sample is separated by gas-chromatography.

26. The method of Claim 21 wherein the sample includes an analyte selected from the group consisting of fungi, bacteria, virus, proteins, polypeptides, nucleic acids, polysaccharides, lipoproteins, glycoproteins, fatty acids and small molecules.

27. The method of Claim 26 wherein the analyte is selected from the group consisting of *B. anthracis* spores and *B. subtilis* spores.

28. The method of Claim 21 wherein samples sources are selected from physiological fluids, breath or food.

29. The method of Claim 28 wherein the samples are selected from headspace of urine or headspace of a food sample.

30. The method of Claim 21 wherein the sample source comprises organic compounds.

31. The method of Claim 30 wherein the organic compounds are stereoisomers.

32. The method of Claim 21 wherein the sample source is a chemical warfare agent.

33. The method of Claim 20 wherein the volatilized sample is optionally directed into an ion mobility spectrometry (IMS) device to obtain a mobility-based signature of at least one marker, wherein the mobility-based signature correlates

with the analytes.

34. The method of Claim 33 wherein the mobility-based signature from IMS device is compared to the mobility-based signature from DMS.

35. The method of Claim 20 wherein the filter electrodes of the DMS device are not coaxially cylindrical.

36. A device for analysis of biological or chemical samples using an aspect of ion mobility, comprising:

(a) a volatilization part; and

(b) differential ion mobility spectrometry (DMS) device, connected to said volatilization part.

37. The device of Claim 36 wherein the volatilization part is selected from the group consisting of pyrolysis device, thermal desorption device, solid phase microextraction/temperature-programmed desorption device, laser ionization device, matrix assisted laser desorption ionization (MALDI) device, microwave excitation device, and a chemical reactor.

38. The device of Claim 37 wherein the volatilization part is a pyrolyzer.

39. The device of Claim 36 further including a gas chromatograph.

40. The device of Claim 36 further including an ion mobility spectrometry device.

41. The device of Claim 36 wherein the filter electrodes of the DMS device are not coaxially cylindrical.

42. The device of Claim 36 wherein the filter electrodes of the DMS device are not

planar.

43. A field asymmetric ion mobility detection system, comprising:

an input part and an output part, said input part including a volatilization part;

at least a pair of spaced insulated substrates cooperating to define between them an enclosed flow path for the flow of ions from the input part to the output part;

at least two electrodes opposite each other and defined in the flow path, the at least two electrodes including at least one filter electrode associated with each substrate to form an ion filter section; and

an electronics part configured to apply controlling signals to the electrodes, and the electronics part applying an asymmetric periodic signal across the filter electrodes for filtering the flow of ions in the flow path, said filter being compensated to pass desired ion species out of the filter section.

44. The device of Claim 43 further including a detector part enabling simultaneous detection of the separate positive and negative ions.

45. The device of Claim 43 further including a selection circuit configured for selectively adjusting the duty cycle of the asymmetric periodic voltage to enable ion species from the sample inlet to be separated, with desired species being passing through the filter for detection.

46. The device of Claim 43, wherein the flow path is planar.

47. The device of Claim 43, wherein the filter electrodes are not coaxially cylindrical.

48. The device of Claim 43 wherein the filter electrodes are not planar.

49. A method of detection and identification of analytes in a sample by an ion-mobility based device, comprising:

(a) directing a portion of a sample into a first separation device thereby obtaining a first profile;

(b) directing a portion of a sample into a second separation device thereby obtaining a second profile, wherein at least one of the first and the second separation devices is a DMS device; and

(c) combining the first and the second profiles thereby identifying at least one analyte in a sample.

50. The method of Claim 49 wherein the same portion of the sample is directed to the first and the second separation devices.

51. The method of Claim 49 wherein the first portion of the sample is directed to the first separation device and the second portion of the sample is directed to the second separation device.